Application of the EMAP Design and Indicators to the NY/NJ Harbor

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The New York/New Jersey Harbor system has been impacted by over 100 years of industrial and human population growth. It has a watershed that encompasses 16,300 square miles, portions of 5 states and a population of over 20 million people. As one of the most heavily utilized shipping ports on the east coast, it also has concentrated refining and manufacturing industries present.

In the early 1990s the sediments of the Harbor were assumed to be heavily contaminated. However, no Harbor-wide information existed on the extent of contamination, which contaminants were responsible or whether biological effects existed. Further there was no way to determine whether water pollution controls, remedial activities, etc. were having any effect or whether the Harbor sediment quality was improving or declining.

The probabilistic design and triad approach of the Environmental Monitoring and Assessment Program (EMAP) provided a cost effective, comprehensive and scientifically defensible monitoring paradigm. A probabilistic sampling program was designed for the baseline investigation and subsequent trend investigation in the Harbor. Synoptic measurements of benthic macroinvertebrate assemblages, toxicity and chemistry were made at 168 stations in 6 sub-basins of the Harbor for the first study and 112 stations in 4 sub-basins for the second investigation. Partners included the Harbor Estuary Program (HEP), ORD and the States of NY and NJ.

Areal estimates of chemical and biological condition were made for the Harbor as a whole and each sub-basin. Chemical contamination was found to be widespread, with all of the Harbor stations having at least one chemical exceeding guidelines that indicate possible biological effects and more than 50% of the Harbor exceeding guidelines that indicate probable biological impacts. A toxicological response was observed for 45% of the Harbor. Impacted benthic macroinvertebrate communities were identified in more than half the Harbor and were strongly associated with chemical contamination. The sub-basins were ranked based on contamination and biological impacts. The subsequent investigation indicated that some aspects of Harbor sediment quality are beginning to slowly but significantly improve. However, biological measures appear to be more resistant to improvement.

The REMAP investigations are being used as a model for the monitoring program for the Harbor. Managers use the information to identify priority areas for future remediation or monitoring and to identify resources to address these areas. Participation in a program with a larger geographic focus also allowed comparison of Harbor condition to the east coast. Additionally, demonstration of the EMAP/REMAP design and indicators has shown the Region 2 states and tribes the utility of this type of monitoring and they will be incorporating these tools into their statewide monitoring programs.

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